

REMARKS/ARGUMENTS

Favorable reconsideration of this application, in light of the following discussion, is respectfully requested.

Claims 1-25 are pending and Claims 12 and 13 are amended by the present amendment. Thus, no new matter is added.

In the outstanding Office Action, Claim 15 was rejected under 35 U.S.C. § 102(b) as anticipated by Nakamura et al. (U.S. Pat. No. 6,108,353, herein “Nakamura”); Claims 1-14, 16-18, 20, 22 and 23 are rejected under 35 U.S.C. § 103(a) as unpatentable over Nakamura in view of Stott et al. (U.S. Pat. No. 6,628,730, herein “Stott”); and Claims 19, 21, 24 and 25 are rejected under 35 U.S.C. § 103(a) as unpatentable over Nakamura and Stott in view of Park et al. (U.S. Pat. No. 6,470,030, herein “Park”).

The outstanding rejection of Claims 1-14, 16-18, 20, 22 and 23 under 35 U.S.C. § 103(a) as unpatentable over Nakamura in view of Stott is respectfully traversed.

As described in the specification and illustrated, for example, in Figures 4(c)-4(e) of the specification, varying degrees of correlation may occur in an interval. The varying degrees of correlation are illustrated in Figure 4(e) and occur within the overlap of the intervals represented in Figures 4(c) and 4(d). According to the claimed invention, these variations and correlations are tracked.¹

Nakamura relates to a demodulating apparatus for OFDM signals. However, Nakamura does not teach tracking the changes in the extent of correlation. According to Nakamura, there is an interval within which a high degree of correlation occurs. The beginning and end of this interval are ignored, and correlation is only measured with a center part of the high correlation period as indicated in Figures 6A to 6F of Nakamura. During the

¹ See, e.g., page 11, line 24 – page 12, line 4 and Figure 7.

period in Nakamura in which the correlation is measured, an integrated output signal is produced, as shown in Figure 6F.

As illustrated in Figure 6F of Nakamura, the integrated signal rises monotonically from the beginning to the end of the period in which correlation is measured. Therefore, according to Nakamura, the peak will always occur at the end of the correlation measurement period.

Stott describes a method for demodulating a video signal in which the timing synchronization includes HUNT and ZOOM processes. The HUNT process considers the entire signal², while the ZOOM process merely considers a subset of the signal³ (the subset being the area of interest where the rising edge of the pulse is located⁴). Further, both the HUNT and the ZOOM processes consider the rising edge of the correlation signal.⁵

Claim 1 recites, in part, “determining respective degrees of correlation in each of plural sub-intervals within said interval, detecting a sub-interval within which a maximum degree of correlation occurs, and providing a synchronisation pulse within the detected sub-interval.” Independent Claim 13 recites similar features.

Therefore, with respect to Claim 1, as noted in the outstanding Office Action, Nakamura does not describe or suggest determining respective degrees of correlation in each of plural sub-intervals within said interval, detecting a sub-interval within which a maximum degree of correlation occurs, and providing a synchronisation pulse within the detected sub-interval.

Accordingly, the outstanding Office Action relies on Stott as curing the above noted deficiency of Nakamura.

² Stott, col. 9, line 27

³ Stott, col. 9, line 29

⁴ Stott, col. 8, line 51

⁵ Stott, col. 8, lines 34-35 and lines 51-53.

The outstanding Office Action states on page 5 that “Stott teaches a method comprising determining respective degrees of correlation in each of plural subintervals with said interval.(Fig. 7, Fig. 8, col. 7, lines 61-67, col. 8, lines 1-19)” However, Stott does not determine degrees of correlation of a plurality of subintervals. Nowhere does Stott mention degrees of correlation or a plurality of subintervals. Instead, Fig. 7, Fig. 8, col. 7, lines 61-67, col. 8, lines 1-19 of Stott describe determining a single rising edge of a correlated symbol pulse.

In other words, Stott does not describe or suggest determining respective degrees of correlation in each of plural sub-intervals within said interval, detecting a sub-interval within which a maximum degree of correlation occurs, or providing a synchronisation pulse within the detected sub-interval.

Therefore, Applicants respectfully submit that independent Claims 1 and 13 claims depending therefrom, patentably distinguish over Nakamura and Stott considered alone or together in any proper combination.

Claim 12 recites, in part, “(i) calculating an error in the current timing (ii) comparing the calculated error with a predetermined threshold and (iii) adjusting the timing of the synchronisation pulse in response to the calculated error exceeding said predetermined threshold.”

Therefore, in a non-limiting example, Claim 12 relates to the idea of adjusting the synchronization pulse timing only if there is a signification timing error (i.e. a calculated error exceeding a predetermined threshold).

The outstanding Action states on page 11 that Nakamura “does not teach the method including the step of (i) calculating the error in the current timing.” However, the outstanding Action relies on Stott as curing this deficiency in Nakamura.

Specifically, the outstanding Action explicitly indicates that the step of “determining the number of pulse unlock events” corresponds to the step of “calculating the error in the current timing,” as recited in Claim 12.⁶ However, the number of pulse unlock events of Stott does not represent the error in the current timing. Instead, the number of pulse unlock events of Stott merely represents the number of symbols periods over which an error has persisted. Claim 12 recites an arrangement whereby the timing of the synchronization pulse will change only if the magnitude of the error exceeds a threshold, whereas the cited portion of Stott merely indicates that the disclosed system will switch from a ZOOM state to a HUNT state if an error (of whatever magnitude) persists for a period represented by the value DELTA.

Therefore, Applicants respectfully submit that independent Claim 12 and claims depending therefrom, patentably distinguish over Nakamura and Stott considered alone or together in any proper combination.

Claim 15 recites, in part, “adjusting the timing of the synchronisation pulse in units of multiple sample periods.”

The outstanding Action cites Nakamura as disclosing the above noted feature.

According to Nakamura, a timing adjustment is based on the average of the calculated timings for the time synchronization signals of multiple symbols. In Nakamura, there is no restriction on the adjustment of this timing. In particular, Nakamura does not disclose or suggest restricting timing adjustments to units of multiple sample periods, as recited in Claim 15.

The outstanding Action cites col. 8, lines 33-51 as the basis for this rejection. However, the cited portion refers to the fact that the timing synchronization is averaged over a predetermined number of symbols. In fact, the cited portion does not address whether or not the amount of adjustment may be restricted.

⁶ outstanding Office Action, page 11 citing col. 8, lines 20 to 33 and lines 51 to 64 of Stott.

Further, on page 19, lines 3 to 5 of the outstanding Action in reference to Claim 24 the outstanding Action states that Nakamura “does not teach adjusting the timing of the synchronization pulse in predetermined quantities corresponding to a plurality of sample periods...” Instead the outstanding Action cites Stott as describing this feature (although Fig. 8, col. 11, lines 11-19 of Park is cited). However, the assertion by the outstanding Action that an “integer-multiple” merely means that the value FTIME must be an integer and as specified the number is set to correspond to a sample index is inaccurate. There is no support for the assertion that changes in FTIME must correspond to multiple sample periods.

Therefore, Applicants respectfully submit that independent Claim 15 and claims depending therefrom, patentably distinguish over Nakamura, Stott or Park considered alone or together in any proper combination.

Claim 20 recites, in part, “generating a synchronisation pulse and using the synchronisation pulse in order to apply Fast Fourier Transform to complex samples derived from the OFDM signal... providing, when the timing of the synchronisation pulse is altered, a signal representing the degree of alteration, and applying to the transformed samples phase rotations determined by this signal.” Claim 24 recites similar features.

In a non-limiting example, Claims 20 and 24 require arrangements in which samples which have been transformed by a Fast Fourier Transform circuit are phase-rotated by an amount determined by a signal representing the degree of alteration applied to the timing of a synchronization pulse.

The outstanding Action cites Stott as reciting the above noted features.⁷ The outstanding Action states that the time sync 26 of Stott is applied “through the FFT 24.” However, the time sync signal is not received by the phase error correction circuit 30 of Stott. Instead the sync signal simply controls the timing of the FFT transformation. Even if it could

⁷ Stott cited on page 16, lines 14 to 17 of the outstanding Office Action.

be argued that the phase error correction circuit 30 in some fashion receives the time sync signal (which it does not), it certainly does not receive a signal which represents the degree of alteration of the timing signal, and therefore does not use such a signal to control the degree of phase rotation.

Further, in reference to Claim 24 the outstanding Action on page 19, lines 16 to 19 states that Park describes the above noted features. However, Park does not describe or suggest the applied phase rotations being determined by a signal representative of the amount of timing alteration.

Therefore, Applicants respectfully submit that independent Claims 20 and 24 and claims depending therefrom, patentably distinguish over Nakamura, Stott or Park considered alone or together in any proper combination.

Consequently, in view of the foregoing discussion and present amendments, it is respectfully submitted that this application is in condition for allowance. An early and favorable action is therefore respectfully requested.

Respectfully submitted,

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